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Evolution and Determinants of Non-Performing Loan Burden in The Group of Seven (G7) Banking Sector

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ABSTRACT
The banking sectors of G7 countries play a crucial role in supporting their economies, yet they remain fragile and susceptible to shocks that may threaten global financial stability. Non-performing loans (NPLs) represent a significant risk to the overall health of the banking system. This study investigates the factors that influence NPLs in the G7 banking sector during the period from 2019 to 2022. We assess the impact of both macroeconomic variables (economic growth, unemployment, and lending interest rates) and bank-specific variables (total assets, net interest income, Tier 1 capital ratio, and credit growth) on NPLs by employing a panel data regression model. The results indicate that economic growth and lending interest rates have a negative and statistically significant effect on NPLs, while the unemployment rate does not exhibit a significant impact. Among the bank-specific variables, only credit growth demonstrates a negative and significant relationship with NPLs. These findings offer valuable insights into the determinants of NPLs and can serve as a foundation for designing more effective risk mitigation strategies within the G7 banking sector.

Keywords: Non-Performing Loans, Macroeconomics, Bank-Specific Factors, Banking Sector, Group of Seven (G7).
JEL Code: G21, G28, E44, C23

I. Introduction

The banking industry is a vital sector in a country's economy, playing a crucial role in mobilizing public funds and channeling them back into the economy through credit to support economic growth. However, credit risk—particularly the burden of non-performing loans (NPLs)—poses a significant challenge, especially for the banking sector in the Group of Seven (G7) countries (Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States) (Nasim et al., 2024). The G7, as a unique forum combining the economic and political power of its member states, acts as a catalyst for collective action in addressing global challenges (Nicholas, 2000). The stability of loan portfolio quality in these countries remained relatively robust until the 2007–2008 global financial crisis, which revealed the close relationship between macroeconomic and financial shocks and highlighted the impact of credit market frictions on financial stability risks (Messai & Jouin, 2013).

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For instance, the surge in mortgage defaults in the United States demonstrated how economic shocks can directly affect the quality of banks' loan portfolios.

The dynamics of NPLs in G7 countries between 2019 and 2022 display noteworthy trends. The significant rise in NPLs in 2020 was driven by the COVID-19 pandemic, which generated economic uncertainty and difficulties for borrowers. Although there was a decline in 2021, NPLs increased again in 2022 due to high inflation and interest rate hikes. This pattern highlights the vulnerability of the G7 banking sector to global economic shocks and underscores the need for sustainable credit risk management to maintain financial stability. Understanding the evolution of NPLs and their determining factors is critical. NPLs represent credit risk borne by banks and are defined as loans that remain unpaid after maturity and legal proceedings, with payments overdue by 90 days or more (Khan et al., 2020). High NPL ratios negatively impact banking stability by tying up funds in non-productive assets, eroding trust between borrowers and lenders, and increasing financial losses due to defaults and bankruptcies (Messai & Jouini, 2013; Sondang, 2025; Octavia, 2021).

The G7 banking sector remains susceptible to NPL dynamics, which have been extensively analyzed following the global financial crisis to identify key determinants. These determinants are broadly categorized into macroeconomic factors—such as GDP growth, public debt, unemployment rate, and domestic credit—and bank-specific factors like credit risk management and internal policies (Milenković et al., 2024; Foglia, 2022; Beck et al., 2015; Pancotto et al., 2024). Poor credit analysis and borrower behavior also contribute to rising NPLs, which in turn negatively affect banks' financial performance by reducing profitability, increasing costs, and creating liquidity problems (Putra & Afriyeni, 2019; Sari et al., 2022). Therefore, this study aims to analyze the evolution of NPLs in the G7 banking sector from 2019 to 2022 and to identify significant macroeconomic and bank-specific influences. Utilizing a unique dataset across developed countries, this research provides valuable insights into credit risk management and financial stability, offering a comprehensive understanding of NPL trends in the G7 banking sector.

II. Literature Review and Hypothesis Development

2.1 Determinants of Non-Performing Loan Burden

The existing academic literature identifies two primary categories of factors that explain the changes in the volume of non-performing loans (NPLs) over time. The first category consists of variables that reflect the broader macroeconomic environment, which affects borrowers' ability to fulfill their financial obligations. The second category pertains to bank-specific characteristics. Previous empirical studies consistently provide evidence highlighting the significance of both categories of determinants.

2.1.1 Macroeconomic Factors

A variety of macroeconomic factors influence non-performing loans (NPLs) in the banking sector. Foglia (2022) and Pancotto et al. (2024) identified a set of macroeconomic variables that include: (i) real GDP growth, (ii) the unemployment rate, and (iii) the lending interest rate. These key macroeconomic factors are discussed below:

a. Economic Growth (GDP Growth) Gross Domestic Product (GDP) is widely recognized as a key indicator for assessing a country's economic development. As a measure of national income, GDP reflects the total market value of all goods and services produced within a country over a specific period (Sayifullah & Emmalian, 2018). It captures the economic activity generated by both domestic and foreign-owned factors of production (Sukirno, 2019), making it one of the most comprehensive indicators of a country's economic performance (Mankiw, 2017). High GDP growth indicates increased economic activity and rising demand for credit. During periods of economic expansion,

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borrowers typically have greater capacity to repay their loans, which contributes to a decline in non-performing loans. Conversely, a decline in GDP growth, particularly when it turns negative, may signal an economic downturn that can impair borrowers' ability to meet their financial obligations, thereby increasing the risk of NPLs (Louzis et al., 2012).

b. Unemployment Rate Unemployment is considered one of the key macroeconomic determinants of non-performing loans (NPLs) due to its significant impact on a country's overall economic condition and its direct influence on the ability of individuals and businesses to repay debt. Marini and Putri (2019) define unemployment as individuals who are part of the labor force, actively seeking employment at a certain wage level, but unable to secure the desired job. Similarly, Pratama et al. (2024) describe unemployed individuals as members of the labor force who are actively looking for employment but are unable to obtain suitable positions. A high unemployment rate reduces overall social welfare, lowers productivity and income levels, and can lead to poverty, crime, and other social issues (Sukirno, 2004). Historically, elevated unemployment rates have undermined borrowers' ability to fulfill their financial obligations and have negatively affected banks' balance sheets (Pancotto et al., 2024). This often results in decreased income and worsening debt conditions. Therefore, we hypothesize that the unemployment rate is positively associated with non-performing loans.

c. Lending Interest Rate
According to Suharti and Ardiansyah (2020), lending refers to the activity of channeling or providing funds to the public. It is a cooperative arrangement between a financial institution, which acts as the capital provider, and a borrower, who uses the capital to support economic activities (Musfiah, 2020). The interest rate represents the cost of borrowing funds and is one of the most influential economic variables, significantly affecting financial markets and asset prices, including those in the money and capital markets. It is typically expressed as an annual percentage based on the amount borrowed (Pangaribuan et al., 2024). Interest rates are also a key monetary policy tool used to control the money supply in the economy. Furthermore, they can be viewed as the return on capital or the opportunity cost of postponing current consumption in favor of future consumption (Idewele, 2022). In addition, interest rates influence individuals' decisions to invest or save (Beni et al., 2023). Wooldridge (2002) observes that during periods of high interest rates, loan default rates tend to rise, resulting in an increase in non-performing loans. Higher borrowing costs deteriorate borrowers' financial positions and reduce their repayment capacity, particularly in the case of variable-rate loan agreements. Therefore, we expect a positive relationship between real lending interest rates and non-performing loans. This relationship reflects the increased debt burden caused by higher interest payments, which leads to a rise in non-performing loans (Bofondi and Ropele, 2011).

2.1.2 Bank-Specific Factors

Consistent with existing literature on the determinants of non-performing loans (NPLs), such as Klein (2013), Louzis et al. (2012), Ghosh (2015), and Pancotto et al. (2024), the selected bank-specific variables in this study include: (i) total assets, (ii) net interest income, (iii) Tier 1 capital ratio, and (iv) annual percentage change in gross loans (loan growth). These factors are described in detail below:

a. Total Aset
Assets are economic resources expected to generate future benefits for business operations (Zumaidah & Soelistyo, 2018). In banking, assets include all rights and resources used in commercial bank operations, such as buildings, trademarks, patents, technologies, cash, and vehicles (Mahdawi et al., 2021). Nadzirah et al. (2016) define total assets as the aggregate value of a company's wealth, comprising fixed assets, current assets, and other assets, which should balance with total liabilities and equity. The study by Pancotto et al. (2024), titled "The Evolution and Determinants of Non-Performing Loan Burdens in the Italian Banking Sector," reports that the estimated coefficient for

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bank size, proxied by total assets, is negative and statistically significant at the 1% and 5% levels. Therefore, we hypothesize a negative relationship between total assets and non-performing loans (NPLs).

b. Net Interest Income

Net interest income (NII) reflects a bank's level of efficiency and is defined as the difference between the interest earned on loans and the interest paid on deposits (Budiantoro, 2017). It arises from allocating funds to productive assets, while interest expenses result from collecting public funds through savings and term deposits (Sinabang & Sembiring, 2015). According to Pancotto et al. (2024), net interest income, as measured through portfolio diversification in large banks, is associated with lower levels of NPLs. However, their research also finds a positive and significant relationship between income diversification (measured by the ratio of non-interest income to total income) and NPLs, suggesting that greater income diversification may be linked to higher NPLs. Therefore, we hypothesize a positive relationship between net interest income and NPLs.

c. Tier 1 capital ratio

Capital is a crucial factor in banking because trust plays a central role in the sector's operations (Rafsanjani, 2020). Bank capital is essential for the institution's functioning, and its adequacy significantly affects the bank's credibility and operational capacity (Rafsanjani, 2020). One of the key indicators of bank soundness is the Tier 1 capital ratio (Ansori & Herizon, 2019). Henri and Wijaya (2017) state that a bank's ability to provide funding for business development can be assessed using capital adequacy ratios, particularly the Tier 1 capital ratio. Marta et al. (2020) explain that the Tier 1 ratio is designed for straightforward calculation using predefined equations and parameter values. Managers in undercapitalized institutions may face incentives, according to the moral hazard hypothesis, to engage in riskier lending practices, often due to poor borrower credit assessments and inadequate monitoring (Zhang et al., 2016). Therefore, we expect a negative relationship between the Tier 1 capital ratio and NPLs. Higher capital levels reduce the incentive to take excessive credit risks (Salas & Saurina, 2002).

d. Loan growth

Loan growth refers to the expansion of a bank's lending portfolio and is influenced by internal and external factors affecting a bank's ability and willingness to extend credit (Fariz Alfiknacio Abdat et al., 2024). It represents the increase in credit demand, observable through the extent of borrowers' engagement with banks (Adolph, 2018). Lestari and Sampurno (2022) define loan growth as the rate of total loan increase within a specific period. Loan growth reflects a situation in which rising credit demand leads to an increase in the volume of loans disbursed by banks (Saputro et al., 2019). Rapid loan expansion may indicate deteriorating lending quality (Baron & Xiong, 2017). Boudriga et al. (2009) found that high loan growth is associated with a decrease in NPL levels. However, other studies show that loan growth can increase NPLs in banks that experienced significant losses in prior periods (Zhang et al., 2016). A sharp rise in loan volume is identified as a primary driver of non-performing loans (Salas & Saurina, 2002) and is positively correlated with future increases in NPLs (Jimenez & Saurina, 2006). Therefore, we hypothesize a positive relationship between loan growth and NPLs.

2.2 Research Framework

Based on the explanation regarding the evolution and determinants of non-performing loan burdens in the banking sector of the Group of Seven (G7) countries:

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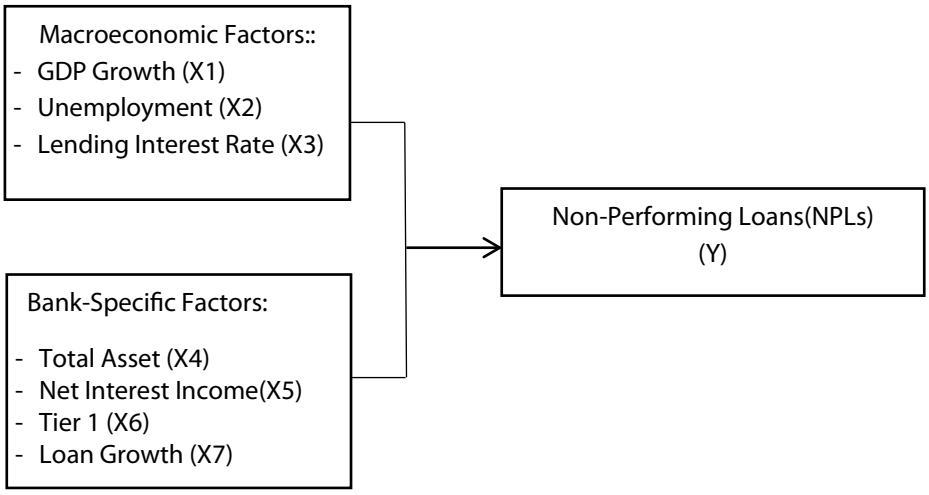

Figure 1. Research Framework

III. Research Method

This study employs a quantitative approach with a panel data regression design to test hypotheses concerning the evolution and determinants of Non-Performing Loans (NPLs) in the G7 banking sector during the period from 2019 to 2022. The research focuses on the burden of NPLs in the G7 banking sector, considering both macroeconomic and bank-specific variables to analyze NPL levels and risky banking practices (Pancotto et al., 2024). The study population includes all annual data on NPL determinants in G7 countries from January 1, 2019, to December 31, 2022.

The initial time series dataset consisted of 2,379 data points, but after data processing, 279 consistent data points remained. Availability sampling was employed due to the priority of complete and consistent data across all variables—namely Non-Performing Loans (NPL), GDP Growth, Unemployment Rate, Lending Interest Rate, Total Assets, Net Interest Income, Tier 1 Capital Ratio, and Loan Growth—to ensure the accuracy of the regression analysis. Although this method is practical and supports comprehensive analysis, availability sampling has limitations in terms of population representativeness and carries the potential for selection bias. Missing data were found to have systematically different characteristics from the retained dataset, which restricts the generalizability of the study's findings. To minimize this bias, the study employs three panel data regression models—Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM)—and selects the best-fit model based on statistical tests (Chow test, Hausman test, and Lagrange Multiplier test). While no new methodology is introduced, the combination of multiple data sources (Osiris BvD, World Bank, and OECD) and different panel regression models aims to generate more accurate and robust estimations.

The data collection method used in this study is secondary data obtained from reliable sources, namely Osiris BvD, the World Bank, and the OECD. Osiris BvD provides data on Non-Performing Loans (NPL), Unemployment Rate, Total Assets, Net Interest Income, Tier 1 Capital Ratio, and Loan Growth. The World Bank provides GDP Growth data, while the OECD supplies Lending Interest Rate data. The sampling technique used is availability sampling, meaning only data that are available for all variables in the same year are included, and any observations with missing variables for a particular year are excluded. This process yielded 279 consistent observations spanning 2019 to 2022. No specific exclusion criteria were applied beyond ensuring year-to-year consistency across variables.The data were analyzed using panel data regression techniques employing three models: the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM), to examine the influence of independent variables on the dependent variable (NPL). This analysis aims to uncover the relationship between macroeconomic and bank-specific factors and the level of

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NPLs in the G7 banking sector. The following equation presents the model specification accounting for both bank-specific and macroeconomic variables:

$$Y = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_6 X_{6it} + \beta_7 X_{7it} + \varepsilon_{it}$$

Notes:

Y : Non-Performing Loan (NPL) Ratio
α : Constant (intercept) Regression coefficients
β1… β7 : Regression coefficients
X1 : Economic Growth
X2 : Unemployment Rate
X3 : Lending Interest Rate
X4 : Total Assets
X5 : Net Interest Income
X6 : Tier 1 Capital Ratio
X7 : Loan growth
ε : Error term (residual)
it : Cross-sectional unit (i) at time (t)

Hypothesis testing is conducted to examine the effects of the independent variables on NPL. The F-test (simultaneous test) is used to assess the overall influence of all independent variables, while the t-test (partial test) evaluates the individual impact of each independent variable. These tests help researchers determine whether the proposed hypotheses are supported and provide deeper insight into the relationships among the variables under investigation.

IV. Results and Discussion

4.1. Result

Based on the analysis of the evolution and determinants of non-performing loan burdens in the banking sector of the Group of Seven (G7), using panel data analysis methods for the period 2019–2022, the findings are as follows:

4.1.1 Descriptive Statistics

The data used in this study is panel data, which combines both time series and cross-sectional data. The time series data cover the annual period from 2019 to 2022, while the cross-sectional data include the G7 member countries: the United States, Japan, Germany, the United Kingdom, France, Italy, and Canada.

Table 1. Descriptive Statistics

Variable	Obs.	Minimum	Maximum	Mean	Std.Dev
Non-Performing Loan	1.120	0,012	49,199	1,239	2,893
Economic Growth	1.120	-10,359	8,674	1,696	3,596
Unemployment Rate	1.120	2,351	9,952	5,444	2,073
Lending Interest Rate	1.120	-0,613	4,344	1,780	1,230
Total Assets	1.120	1,350	5,770	2,800	7,930
Net Interest Income	1.120	4,280	1,060	3,680	1,020
Tier 1 Capital Ratio	1.120	8,23	3,44	14,096	3,773
Loan Growth	1.120	-23,479	109,124	10,816	14,755

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Table 1 presents the descriptive statistics of the dependent variable (NPL) and the explanatory banking variables used in the empirical analysis. It reports the number of observations ("Obs.") based on bank-year samples, the minimum ("Minimum") and maximum ("Maximum") values, the mean ("Mean"), and the standard deviation ("Std. Dev."). The sample period covers the years 2019 to 2022.

4.1.2 Panel Data Regression Analysis

4.1.2.1. Model Selection Test

Panel data regression analysis generally uses three models: the Common Effect Model (CEM), the Fixed Effect Model (FEM), and the Random Effect Model (REM).

Table 2. Model Selection Test Results

Test Name	P-Value	Conclusion
Chow Test (CEM vs. FEM)	0,000	FEM
Hausman Test (FEM vs. REM)	0,969	REM
Lagrenge Multiplier Test (REM vs. CEM)	0,000	REM

Table 2 presents the results of the panel regression model selection tests. The Chow Test yields a p-value less than 0.05, which rejects the null hypothesis (H0) and supports the alternative hypothesis (H1), indicating that the Fixed Effect Model (FEM) is preferred over the Common Effect Model (CEM). However, the Hausman Test produces a p-value greater than 0.05, leading to acceptance of the null hypothesis (H0), which suggests that the Random Effect Model (REM) is more appropriate than the Fixed Effect Model. Finally, the Lagrange Multiplier Test yields a p-value less than 0.05, leading to the rejection of the alternative hypothesis (H1) and acceptance of the null hypothesis (H0), again supporting the selection of the Random Effect Model. Based on the overall results of these tests, the Random Effect Model (REM) is identified as the most suitable regression model for this study.

4.1.2.2. Panel Regression Results Using the Random Effect Model (REM)

The Random Effect Model (REM) is used to estimate panel data where error terms may be correlated across time and between entities (such as firms or countries). This model differs from the Common Effect and Fixed Effect models because it employs maximum likelihood estimation or generalized least squares (GLS) instead of ordinary least squares (OLS).

Table 3. Panel Regression Results: Random Effect Model (REM)

Dependent Variable: NPL	Coefficient	Std. err.	Z	P> z
Economic Growth (EG)	-0,031	0,006	-4,76	0,000
Unemployment Rate (UNEMP)	-0,026	0,019	-1,40	0,160
Lending Interest Rate (INT)	-0,139	0,025	-5,42	0,000
Total Assets (TA)	-5,180	2,200	-0,23	0,814
Net Interest Income (NII)	-5,880	1,580	-0,37	0,709
Tier1 Rasio (Tier1)	0,015	0,019	0,79	0,432
Loan Growth (LG)	-0,005	0,001	-2,97	0,003
Constant	1.522	0,341	4.46	0.000
Number of Observations	1.120			
R-squared	0,023			
Wald chi2	0,000			
Prob > chi2	0,000			

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Based on Table 3, the multiple linear regression results show that certain variables have a statistically significant impact on Non-Performing Loans (NPLs), while others do not. Among the macroeconomic variables, Economic Growth and Lending Interest Rate significantly affect NPLs, whereas the Unemployment Rate does not. Economic Growth has a p-value of 0.000 (less than 0.05) and a coefficient of -0.031, indicating a significant negative relationship—suggesting that higher economic growth leads to lower NPL levels. In contrast, the Unemployment Rate has a p-value of 0.160 (greater than 0.05) and a coefficient of -0.026, pointing to a negative but statistically insignificant effect on NPLs. Although the direction of the relationship is negative, the result is not statistically supported. The Lending Interest Rate shows a significant negative relationship with NPLs, with a p-value of 0.000 and a coefficient of -0.139, indicating that higher interest rates are associated with fewer non-performing loans.

Regarding bank-specific variables, only Loan Growth demonstrates a statistically significant influence on NPLs. Total Assets, Net Interest Income, and the Tier 1 Capital Ratio do not show significant effects. Total Assets has a p-value of 0.814 and a coefficient of -5.180, suggesting a negative but insignificant impact. Similarly, Net Interest Income (p-value 0.709, coefficient -5.880) and Tier 1 Capital Ratio (p-value 0.432, coefficient 0.015) also display statistically insignificant relationships with NPLs. In contrast, Loan Growth has a p-value of 0.003 and a coefficient of -0.005, indicating a significant negative effect—implying that increased loan growth, potentially reflecting improved credit allocation, is associated with reduced levels of non-performing loans.

4.1.3 Hypothesis Testing

4.1.3.1. Simultaneous Effect Test (F-Test)

This test is conducted to analyze the simultaneous effect of the independent variables on the dependent variable. As shown in Table 3, the model's probability value (Prob > chi^2) is 0.000, which is less than 0.05, and the Wald chi^2 statistic is also 0.000. These results indicate that collectively, the macroeconomic variables (Economic Growth, Unemployment Rate, and Lending Interest Rate) and bank-specific variables (Total Assets, Net Interest Income, Tier 1 Capital Ratio, and Loan Growth) have a significant effect on non-performing loans (NPL) in the model.

4.1.3.2. Partial Effect Test (t-Test)

The t-test is conducted to assess the individual impact of each independent variable on Non-Performing Loans (NPL). The results show that Economic Growth (coefficient = -0.031, p-value = 0.000), Lending Interest Rate (coefficient = -0.139, p-value = 0.000), and Loan Growth (coefficient = -0.005, p-value = 0.003) have a significant effect on NPL. In contrast, Unemployment Rate (coefficient = -0.026, p-value = 0.160), Total Assets (coefficient = -5.180, p-value = 0.814), Net Interest Income (coefficient = -5.880, p-value = 0.709), and Tier 1 Capital Ratio (coefficient = 0.015, p-value = 0.432) do not have a statistically significant effect on NPL.

4.2. Discussion

4.2.1 The Influence of Macroeconomic Variables

4.2.1.1. The Effect of GDP Growth on Non-Performing Loans (NPL)

The findings of this study reveal a significant negative correlation between economic growth (GDP Growth) and non-performing loans (NPL) during the 2019–2022 period. GDP Growth has a significance value of 0.000 (less than 0.05) and a coefficient of -4.76, indicating that an increase in economic growth during the

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observed period is associated with a reduction in NPL. Strong economic growth contributes to a decline in non-performing loans. When the economy expands, household income tends to rise, thereby improving borrowers' ability to meet their debt obligations. This result is consistent with prior studies suggesting that negative or declining economic growth signals a recession, during which household income typically decreases, impairing borrowers' capacity to repay loans and leading to an increase in NPLs (Chaibi & Ftiti, 2015). The findings of Boudriga et al. (2009) also support this relationship, stating that economic growth, along with other macroeconomic factors, significantly influences NPLs in Mediterranean countries, where positive economic growth tends to reduce NPL levels. Similarly, studies by Louzis et al. (2012) and Ghosh (2015) show that an increase in public debt relative to GDP is positively correlated with a rise in NPLs, highlighting the important role of the public debt ratio in influencing NPL levels in the banking sector.

4.2.1.2. The Effect of the Unemployment Rate on Non-Performing Loans (NPL)

The results indicate that the unemployment rate does not have a significant impact on NPLs in the G7 banking sector. The p-value is 0.160 (greater than 0.05), with a coefficient of -1.40. This may be attributed to relatively stable unemployment rates, influenced by effective government policies that maintain employment levels. As a result, individuals are generally able to meet their loan obligations, contributing to the stability of the banking sector and preventing an increase in NPLs. Several prior studies, including Ropele (2011), Louzis et al. (2012), and Anastasiou et al. (2019), note that rising unemployment can potentially lead to lower income levels and worsening debt conditions. Additionally, Pancotto et al. (2024) found that past unemployment rates negatively affected borrowers' ability to fulfill their debt obligations, which in turn adversely affected the balance sheets of banks in Italy.

4.2.1.3. The Effect of Lending Interest Rate on Non-Performing Loans (NPL)

The study results demonstrate a significant negative correlation between the lending interest rate and non-performing loans (NPLs), with a significance value of 0.000 (< 0.05) and a coefficient of -5.42. The large negative coefficient indicates that an increase in lending rates significantly weakens borrowers' financial positions, impairs their debt repayment capacity, and contributes to the growth of NPLs in the banking sector. This finding is consistent with the study by Wood & Skinner (2018), which suggests that high interest rate periods are often associated with increased default rates among borrowers, leading to higher NPL levels. Additional research also supports this view, demonstrating a positive correlation between real interest rates and NPLs (Nkusu, 2011; Louzis et al., 2012; Beck et al., 2015), emphasizing how rising interest rates—particularly for variable-rate loans—can reduce borrowers' ability to repay and worsen credit quality.

However, this study's findings contrast with those of Pancotto et al. (2024), who argue that since 2015, lending interest rates have no longer played a significant role in explaining the volume of non-performing loans. This suggests a shift in the underlying factors driving credit risk, indicating that other variables have increasingly influenced the rise in problematic loans in recent years.

4.2.2 The Influence of Bank-Specific Variables

4.2.2.1. The Effect of Total Assets on Non-Performing Loans (NPL)

The results of this study indicate that total assets do not have a significant effect on Non-Performing Loans (NPLs) in the banking sector of G7 countries, as evidenced by an insignificant p-value of 0.814 (greater than 0.05) and a coefficient of -0.23. These findings suggest that bank size is not a primary determinant of NPL levels; although larger banks may face greater risk exposure, strict regulatory frameworks and effective risk management practices help mitigate these risks. Strong supervisory systems ensure that banks of all sizes are managed under uniform standards. This result contradicts the findings of Berger et al. (2005), who argued that

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large institutions may encounter difficulties in accessing borrowers' financial information, thereby increasing the risk of NPLs. However, it is consistent with the findings of Pancotto et al. (2024), whose study on problem loan burdens in the Italian banking sector revealed a negative and significant relationship between total assets and NPL ratios.

4.2.2.2. The Effect of Net Interest Income on Non-Performing Loans (NPL)

This study finds that Net Interest Income (NII) does not significantly affect NPLs in the banking sector of G7 countries. This is supported by an insignificant p-value of 0.709 (greater than 0.05) and a coefficient of -0.37. Although NII is generally considered a key indicator of a bank's financial health and is intuitively expected to negatively correlate with NPLs (i.e., healthier banks tend to have lower NPLs), the results suggest otherwise. This indicates that other factors—such as economic cycles and credit management quality—may play a more dominant role in determining credit quality. In other words, high NII does not necessarily guarantee low NPL levels. The inherent risks in the intermediation function of banks cannot be fully mitigated by increasing NII alone. Effective credit risk management, beyond simply maximizing interest income, remains a key determinant in reducing NPLs.

This result is consistent with Coopers (2018), who stated that net interest income (proxied by diversification) in banking activities is negatively associated with NPLs, where higher diversification levels reduce credit risk and improve financial stability. However, it diverges from Pancotto et al. (2024), who found a positive and significant relationship between income diversification (measured by the ratio of non-interest income to total income) and NPLs in large banks. This suggests that increasing income diversification may correlate with higher NPL levels.

4.2.2.3. The Effect of Tier 1 Capital on Non-Performing Loans (NPL)

The study shows that Tier 1 Capital does not significantly influence NPLs in the banking sector of G7 countries, as indicated by a p-value of 0.432 (greater than 0.05) and a coefficient of -0.79. While Tier 1 Capital—a measure of a bank's financial strength and loss-absorption capacity—is theoretically expected to negatively correlate with NPLs (i.e., higher capital should mean lower risk), the effect is statistically insignificant in this context. This may be attributed to other prevailing factors that more strongly influence asset quality in these countries, such as robust macroeconomic stability and effective banking regulation. Despite the inherent risks in banking intermediation, these risks appear to be well managed in G7 countries, minimizing the impact of Tier 1 Capital levels on NPLs. This finding implies that strong macroeconomic conditions and stringent regulatory oversight have effectively mitigated risks that would otherwise be addressed by higher capital buffers. This finding aligns with the theory that undercapitalized institutions face incentives to engage in riskier lending practices due to poor credit assessment and monitoring. Furthermore, poorly capitalized banks may lend to weaker borrowers in a "gamble for resurrection," particularly under conditions of informational opacity. Therefore, a negative relationship between capital strength and NPL ratios is expected, as higher capital reduces the incentive to take on excessive risk—a view also supported by Salas and Saurina (2002). However, the results contradict Pancotto et al. (2024), who reported a significant negative relationship between Tier 1 Capital ratios and NPL volumes. Their estimates indicate that banks with higher Tier 1 Capital ratios tend to have lower NPL volumes.

4.2.2.4. The Effect of Loan Growth on Non-Performing Loans (NPL)

The study finds a significant negative correlation between Loan Growth and NPLs, with a p-value of 0.003 (less than 0.05) and a coefficient of -2.97. This implies that increases in loan volume can lead to a rise in NPLs. Aggressive loan expansion often signals poor credit screening and is associated with greater lending to high-risk borrowers, thus increasing the likelihood of future loan defaults. This finding is consistent with Abbas

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et al. (2021), who observed a significant negative relationship between credit growth and credit risk. Salas and Saurina (2002) also argued that rapid credit expansion is a primary driver of NPL growth, while Saurina (2006) predicted a positive relationship between loan growth and future NPLs. Several previous studies consistently support this view, showing a positive association between credit growth and rising NPLs. Vithessonthi (2016) noted that high lending rates by banks contribute to an increase in NPLs. This is further supported by Zhang et al. (2016), who found that loan growth increases NPLs, particularly among banks that had previously experienced significant losses. Additionally, Baron and Xiong (2017) argued that rapid credit growth may reflect poor lending standards, thereby leading to a deterioration in loan quality.

5. Conclusion

Based on the findings of this study, several conclusions can be drawn regarding the evolution and determinants of non-performing loan (NPL) burdens in the G7 banking sector. The results indicate that some variables significantly influence NPL levels, while others do not. Economic growth (GDP growth) has a significant negative effect on NPLs, suggesting that a strong economy enhances borrowers' ability to fulfill their debt obligations. Similarly, the lending interest rate also exerts a significant negative influence on NPLs, indicating that higher interest rates may constrain borrowers' capacity to repay their loans. In contrast, the unemployment rate does not have a significant impact on NPLs, likely due to effective government policies that maintain stable employment levels. Among bank-specific variables, total assets, net interest income, and the Tier 1 capital ratio also do not show significant effects on NPLs. However, rapid loan growth has a significant negative relationship with NPLs, indicating that credit expansion without proper credit assessment can increase the risk of loan defaults. This study plays an important role in highlighting the dynamics of non-performing loan burdens in the G7 banking sector, particularly in the context of risk management and credit behavior. The findings provide valuable insights for G7 banks in managing credit risk and underscore the need for further investigation of the factors that significantly affect NPLs. Moreover, the study emphasizes the importance of sound economic policies and effective regulatory frameworks in preventing future financial crises.

Theoretically, this study enriches the understanding of the dynamics of non-performing loan burdens in the G7 banking sector, especially within the context of risk management and credit behavior. The findings demonstrate that both macroeconomic factors and bank-specific characteristics play a complex role in influencing NPLs. This research also contributes to the development of risk management theories, credit behavior frameworks, and the understanding of problem loan patterns within the banking sector. Practically, this study provides valuable insights for G7 banks in managing credit risk and reducing the burden of non-performing loans. The findings may also assist regulators in formulating more effective policies and regulations to maintain banking sector stability. Furthermore, this research is expected to serve as a useful reference for the public and other researchers conducting further studies on related topics.

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